

PATENT
Atty. Docket No. 209294US-2

Appl. No. 09/867,464
Reply to Office Action of: November 18, 2002

REMARKS

Favorable reconsideration of this Application as presently amended and in light of the following discussion is respectfully requested.

After entry of the foregoing amendment, Claims 1-12 and 14-39 are pending in the present application. Claim 13 has been canceled, without prejudice or disclaimer as its subject matter has been incorporated into Claim 14, as amended. Claims 16 and 17 have been amended to change their respective dependencies. No new matter has been added.

By way of background, the Official Action presents the following issues:

Claims 1-4, 19 and 39 stand rejected under 35 U.S.C. § 102 as lacking novelty with respect to Sato et al. (U.S. Patent No. 5,499,099, hereinafter Sato); Claims 5, 7-9, 13, 16-17, 22, 31 and 38 stand rejected under 35 U.S.C. § 103 as being obvious in view of Sato and Irie et al. (U.S. Patent No. 5,808,910, hereinafter Irie); and Claim 25 stands rejected under 35 U.S.C. § 103 as being obvious over Sato and Irie in further view of Tomimato (U.S. Patent No. 6,239,858).

Claims 35-37 stand allowed. Further, Claims 6, 10-12, 14, 15, 17, 18, 20, 21, 23-24, 26-30 and 32-34 are objected to as being depended upon a rejected base claim only. Applicant appreciatively acknowledges the identification of allowable subject matter. Finally, Applicant notes that as Claim 14 has been amended to incorporate the subject matter of the base claim, Applicant submits that Claim 14 and any claim depending therefrom are

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now in condition for allowance, therefore, such claims will not be discussed with respect to the substantive rejections outlined herein.

REJECTION UNDER 35 U.S.C. § 102

The Official Action has rejected Claims 1-4, 19 and 39 under 35 U.S.C. § 102 as being unpatentable over Sato. The Official Action states that Sato discloses all of the Applicant's claim limitations. Applicant respectfully traverses the rejection.

Amended Claim 1 recites, *inter alia*, an evaluation method including:

“... evaluating regularity and degree of a nonlinear distortion of said substrate by using an evaluation function that is used to obtain correlation, concerning, at least direction, between a first vector representing said position deviation amount of a given divided area on said substrate and second vectors each of which represents said position deviation amount of a divided area of a plurality of divide areas around said given divided area.”

By way of background, in manufacturing semiconductor chips, a great degree of accuracy is needed for applying a laser repair signal to a specific location of the semiconductor device such as utilized in a step and scan method. This laser positioning is often performed in conjunction with a detected alignment mark. As such, either a die-by-die method alignment method is utilized or an enhanced global alignment (EGA) is utilized for calculating the positioning of the laser based upon the detected alignment mark.¹ Presently,

¹ Application at pages 1-9.

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current alignment methods are process intensive and require recalculation on a wafer- by-wafer basis.

In light of the above deficiency in the art, the present invention is provided. With this object in mind, a brief comparison of the claimed invention in view of the cited references is believed to be in order.

Sato discloses that the positions of all shots on a wafer W1 (a first wafer of one lot) are measured to obtain a nonlinear error E (e1, e2 ---e24) of each shot, and when a second wafer W2 is aligned, a position of each shot is obtained using transformation parameters B2, θ2 and S2. The transformation parameters are obtained based on measurement results of a plurality of measurement points on the second wafer (a measurement shots in Fig. 4B: the number of measurement shots on the second wafer is fewer than the number of measurement shots on the first wafer), and the nonlinear error E (ei) which has been obtained for the wafer W1.²

Sato discloses a second embodiment that nonlinear errors of a plurality of measurement shots on the wafer W1 (S1, S3, S6, S7, S9 --- S19, S21, S24)³ are obtained, and spline interpolation is executed using the obtained nonlinear errors to obtain correction functions for all the shots on the wafer (including non-measured shots). In addition, Sato discloses that when processing a second wafer W2, parameters Bs2, θs2 and Ss2 indicating

² Sato Figs. 3-4; column 5, line 18 through column 7, line 1.

³ Sato Fig. 6A.

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linear errors are obtained based on measurement results of a plurality of measurement shots on the wafer W2 (Fig. 6B), and a position of each shot on the wafer W2 is obtained using the parameters and the functions Cx, Cy (Ci) which have been obtained for the wafer W1. Optimum measurement shots are selected on the basis of nonlinear errors obtained through measurement. Sato discloses that a pattern of measurement shots with minimum nonlinear errors is selected out of four patterns of measurement shots, i.e., four arrangement patterns as illustrated in Figs. 9A-9D.

Conversely, Applicant's invention provides an evaluation function with obtains a correlation relative to a direction between a first vector and a second vector which represents a position deviation amount as presently recited in Claim 1.

Sato discloses that the best arrangement patterns is selected out of four arrangement patterns in which arrangements of measurement shots have been determined beforehand.

Measurement shots existing in areas where nonlinear errors exceeds a predetermined threshold t_n on a wafer are not used as measurement shots to obtain transformation parameters.⁴ Sato does not disclose or suggest grouping a plurality of shot areas based on nonlinear errors as recited in amended Claim 1.

Further, the present invention is able to group a plurality of shot areas into blocks beforehand based on indices representing irregularity and degree of a nonlinear distortion on a substrate as presently recited in Claim 19. Finally, an alignment mode can be altered

⁴ Sato at column 8, lines 48-51.

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depending upon whether errors between shot areas are predominate or not as presently recited in Claim 39.

Accordingly, Applicant respectfully requests that the rejection of Claims 1-4, 19 and 39 under 35 U.S.C. § 102 be withdrawn.

REJECTION UNDER 35 U.S.C. § 103

The Official Action has rejected Claims 5-9, 22, 31 and 38 under 35 U.S.C. § 103 as being unpatentable over Sato in view of Irie. The Official Action states that Sato discloses all of the Applicant's claim limitations with the exception of utilizing statistic computation with three specific areas of samples. The Official Action cites Irie as disclosing this more detailed aspect of the Applicant's invention and states that it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of the cited references to arrive at the Applicant's claims. Applicant respectfully traverses the rejection.

As discussed above, Sato does not disclose or suggest utilizing an evaluation function to obtain a correlation pertaining to a direction between a first vector and a second vector which represents position deviation amounts as recited in the Applicant's claims. Likewise, Irie does not disclose or suggest the above-identified deficiency. Thus, neither Sato, alone or in combination with Irie, disclose or suggest the Applicant's claims.

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Further, as recited in Claim 38, there is no teaching or suggesting of judging how overlay errors in a plurality of lots are, and to perform position control of a substrate in different control methods in accordance with the judgement results.

Accordingly, Applicant respectfully requests that the rejection of Claims 5-9, 22, 31 and 38 under 35 U.S.C. § 103 be withdrawn.

The Official Action has rejected Claim 25 under 35 U.S.C. § 103 as being unpatentable over Sato and Irie, in further view of Tomimoto. The Official Action states that the combination of Sato and Irie teach all of the features of the rejected claim with the exception of the use of a correlation map. The Official Action cites Tomimoto as disclosing this more detailed aspect of the Applicant's claim and states that it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Sato and Irie to arrive at the Applicant's claims. Applicant respectfully traverses the rejection.

As discussed above, Sato does not disclose or suggest forming a utilizing an evaluation function to obtain a correlation pertaining to a direction between a first vector and a second vector which represents position deviation amounts as recited in Applicant's claims. Likewise, neither Irie nor Tomimoto disclose or suggest this more detailed aspect of the Applicant's claim. As such, the combination of the cited references do not disclose or suggest Applicant's Claim 25.

Accordingly, Applicant respectfully requests that the rejection of Claim 25 under 35 U.S.C. § 103 be withdrawn.

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CONCLUSION

Consequently, in view of the foregoing amendment and remarks, it is respectfully submitted that the present Application, including Claims 1-12 and 14-39 is patentable distinguished over the prior art, in condition for allowance, and such action is respectfully requested at an early date.

Finally, the attention of the U.S. Patent and Trademark Office is directed to the change of address of Applicants' representative, effective January 6, 2003:

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Please direct all future communications to this new address.

Respectfully submitted,

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